DISCOVERY

Characteristics of Rice Production Enterprise in Ayamelum Local Government Area of Anambra State, Nigeria

Hyacinth Udeanya Nwalieji

Department of Agricultural Economics & Extension, Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus, Anambra State, P.M.B. 6059, Awka, Anambra State, Nigeria
E-mail: hu.nwalieji@coou.edu.ng
Phone: +2347033994751

Citation
Hyacinth Udeanya Nwalieji. Characteristics of Rice Production Enterprise in Ayamelum Local Government Area of Anambra State, Nigeria. *Discovery*, 2021, 57(302), 154-163

ABSTRACT

The study examined characteristics of rice production enterprise in Ayamelum Local Government Area of Anambra State, Nigeria. Purposive and simple random sampling techniques were used in the selection of 100 respondents for the study. An interview schedule was used to elicit information during 2019 planting season. Percentage, mean score and gross margin analysis were used for data analysis. The findings showed that the majority (80%) of the farmers had formal education while the mean age and farm size were 44.10 years and 1.70 hectares, respectively. Majority cultivated rice in lowland areas, grew FARO 44 rice variety, used tractor in land cultivation, combined manual and mechanical means of rice harvesting, and used unimproved processing equipment/machine. The average quantity, production costs, revenue, and gross margin/net profit of paddy and milled rice produced per a hectare were 2.4tonnes and 2.1tonnes, N246,700 and N355,900, N440,000 and N588,000, and N193,300 and N232,100, respectively. The farmers were highly involved in Fadama projects, ADP, USAID MARKETS Project, Lower Anambra Irrigation Project (LAIP), IFAD Value Chain Development Project, GES Scheme, Anambra State Government programmes and Rice Box (R-Box).Inter and intra communal clash over land ownership, cattle menace, inadequate and untimely supply of agro-inputs to farmers, difficulty in obtaining credit, inadequate improved processing and milling machinery were the serious constraints to rice production. The need for government to provide various rice farmers' groups with low capacity complete set of rice milling machines at subsidized rate was recommended among others.

Keywords: Rice production, processing, challenges, Anambra State

INTRODUCTION

Rice (*Oryza sativa*) is the most important staple food for about half of the human race (Akpokodje, Lançon and Erenstein, 2001). Oduntan(2019) reported that World rice production statistics affirmed thatout of the 14.6 million metric tonnes of paddy rice

ISSN 2278–5469 EISSN 2278–5450 I OPEN ACCESS

produced annually on 7.3 million hectares of land in Africa, Nigeria's production rose from 3.7 million metric tonnes in 2017 to 4.0 million metric tonnes in 2018. This, according to the report, ranks the nation as the largest producer of rice in the black continent of Africa. Oduntan (2019) further noted that the market value of the current quantity of local rice produced in Nigeria is about 684 billion naira ($1.9 billion); and this makes the country the sixteenth top producer of rice in the world. The country according to him produced more than enough local rice for home consumption need and has drastically reduced the huge burden of foreign rice importation into the country. He further recalled that Nigeria has a total land area of about 923,768 square kilometres, a total of 71.2 million hectares is devoted to agricultural production and of which about 5.0 million hectares are available for rice production with respect to the different rice environments or ecologies available in the country.

Okeke and Oluka (2017) noted that the paddy rice after harvesting and threshing, is parboiled and milled using manual or mechanical method. According to them, before milling, rice grain is dried in order to reduce the moisture content to about 19% to avoid breakage of the seeds during milling; and the drying can be done through naturally occurring sunshine. Nwalieji, Madukwe, Agwuand Umerah (2014) however identified inadequate fund for start-off, difficulty in obtaining credit, inadequate improved processing and milling machinery, late supply of agro-input by the service providers, lack of direct services to farmers in the area of agro input and credit supply, difficulty in marketing products, difficulty in forming co-operative society and poor extension service visit to farmers as major challenges in rice production and implementing rice projects. The results of factor analysis of these challenges, according to them are named agro-input, socio-economic, poor services and financial factors.

Nigeria is however the largest rice producing country in West Africa, but is also the second largest importer of rice in the World, while Anambra and Ebonyi States are the major rice producers in the southeast Nigeria, in which Anambra is at the top (Nwalieji, 2016). In Anambra State, Ayamelum LGA is the major rice producing LGA among the 21 LGAs in Anambra State; thereby making Ayamelum the "Rice Food Basket" of Anambra State, Nigeria (Nwalieji, 2020). The need to examine the characteristics of rice production enterprise in Ayamelum Local Government Area of Anambra State, Nigeria becomes imperative. The study was therefore designed specifically to: examine the socio-economic characteristics of rice farmers; identify rice production practices among the farmers; determine profitability of rice production enterprise in the area; ascertain the extent of farmers' involvement in rice intervention programmes and projects; and identify constraint to rice production in the area.

MATERIALS AND METHODS

The study was carried out in Ayamelum local government area (LGA). Ayamelum LGA is one of the 21 local government areas in Anambra State, Nigeria and is made up of 8 communities viz- Omor, Anaku, Umerum, Umumbo, Igbakwu, Ifite-ogwuari, Umueje and Omasi. It is located at the North East of the State situated on the shores of the Omambala and Ezu Rivers. Ayamelum L.G.A has land area of 196 km^2 and an estimated population of 223,641 in 2017 and 233,763 persons in 2019, using the state's growth rate of 3.2% projection of the 2006 census figures of the National Population Commission (NPC), (The Anambra State Statistical Year Book (SYB), 2017). Agriculture is the major occupation in Ayamelum, engaging more than 90% of the population. Crops, livestock and fisheries are main stock in the farming system of the Local Government. Rice processing industry in Ayamelum is fast growing in number owing to the massive production of paddy by the farmers. The River Basin Authority 10,000M/T per Annum Giant Rice Mill is sited at Umumbo community, Ayamelum LGA. The mill as the name implies, though not functioning properly, is one of the largest rice mills in West Africa.

The population of the study comprised all the rice farmers in Ayamelum LGA of Anambra State. Purposive and simple random sampling techniques were used in the selection of 100 respondents for the study. Five communities- Omor, Anaku, Umumbo, Ifite-ogwuari and Omasi were purposively selected for the study due to their notable high rice production activities. Twenty rice farmers were selected from each selected community using simple random sampling technique. This gave a total of 100 farmers that served as sample size for the study.

Data were collected from primary source with the aid of validated structured interview schedule. The instrument was used to elicit information from the respondents for 2019 planting season based on the objectives of the study, through the help of agricultural field officers covering the area for the administration.

To identify rice production practices among the farmers, the respondents were asked to indicate the rice production practices they use or apply in their farms. To determine profitability of rice production enterprise, the respondents were asked to indicate the cost and return of 1 hectare of rice paddy for the 2019 planting season. To ascertain the extent of farmers' involvement in rice intervention programmes and projects, a 4-point Likert- type scale of high involvement (4), moderate involvement (3), low involvement (2) and no involvement (1) with a mean of 2.50 as cut off value was used to collect the data. Variables with mean scores

ISSN 2278–5469 EISSN 2278–5450 I OPEN ACCESS

of 2.50 and above were regarded as high involvement of the respondents in the intervention programmes and projects, while those with mean scores less than 2.50 were regarded as not involved in the project.

To identify constraints to rice production in the area, the respondents were asked to indicate on a 4-point Likert- type scale how serious the various shortlisted problems militate rice production in the area. Their response categories include very serious (4), serious (3), somewhat serious (2) and not serious (1) with a mean of 2.50 as cut off value. Variables with mean scores of 2.50 and above were regarded as serious problems, while those with mean scores less than 2.50 were regarded as not serious problems. Percentage, mean score and gross margin analysis were used for data analysis.

RESULTS AND DISCUSSION

Socio-economic characteristics of rice farmers

Table 1 shows percentage distribution of respondents according to their socio-economic characteristics. It is evident from the table that greater percentage (40%) of the rice farmers were between 40-49 years of age, while their mean age was 44.10 years. This implies that rice farmers in the area were at their middle and productive age. This finding is in line with that of Nwalieji, Uzuegbunam and Okeke (2015) which reported that majority of rice farmers are still within their middle, active and productive ages and hence can engage efficiently in rice production. Majority (73%) of the respondents were male, and majority (88%) were married. These imply male and married farmers' dominance in rice production enterprise in the area. The finding is in line with that of Oyeleke (2009) who opined that rice production is clearly the work of men, whereas rice post-harvest activities are clearly the domain of women.

Table 1 further shows that majority (80%) of the farmers had formal education, while 20% had no formal education. The findings imply that the farmers are knowledgeable enough, hence can adopt improved rice production technologies. Majority (66%) of the respondents had household sizes of 6-10 persons and the mean household size was 8 persons. These finding implies that farmers had very large household sizes which could provide cheaper source of farm labour. Greater proportion (44%) of the farmers had 10-19 years of rice farming experience and the mean rice farming experience was 19.10 years. This finding implies that the farmers had very long years of rice farming experience which could serve as an advantage in participation and adoption of improved rice technologies introduced in the area. Also greater proportion (42%) of farmers had between 0.1-1.0 hectares and the mean total rice farm land owned was 1.70 hectares. This finding implies that rice farmers are generally relatively small holders. Table I also reveals that majority (70%) of the respondents rented their rice farm land. Majority (65%) of the farmers financed their farm operations through personal savings, implies that majority of farmers funded their rice production from their personal savings from income realized, which may be from sale of rice in the previous year or any other venture. Majority (76%) of the respondents sourced their agro-input from market/private dealers, implies that the major source of agro-input of the rice farmers in the study area is from the market/private dealers, maybe due to its availability all year round, notwithstanding the high cost.

Table 1: Percentage distribution of respondents according to their socio-economic characteristics (n=100)

Variable	Percentage (%)	Mean (M)
Age (years)		
20-29	4	
30-39	28	
40-49	40	44.10 years
50-59	24	
60-69	4	
Sex		
Male	73	
Female	27	
Marital status		
Single	2	
Married	88	
Widowed	10	
Educational level		
No formal education	20	
Primary school	30	

ISSN 2278–5469 EISSN 2278–5450 I OPEN ACCESS

Secondary school	35	
Tertiary education	15	
Household size (number)		
1-5	22	
6-10	66	8 persons
11-15	12	
Rice farming experience (years)		
0-9	12	
10-19	44	
20-29	32	19.10 years
30-39	10	
40 and Above	2	
Total rice farm size (hectare)		
0.1-1.0	42	
1.1-2.0	28	
2.1-3.0	14	1.70 hectare
3.1-4.0	8	
4.1-5.0	6	
Above 5.0	2	
Source of rice farm land*		
Family land	56	
Rented	70	
Inherited	42	
Communal land	33	
Government	40	
Source of credit/finance for take-off		
Isusu club	4	
Personal savings	65	
Bank loan	16	
Local money lender	15	
Source of agro-inputs		
Market/dealer	76	
Government/Intervention projects & programmes	24	

* =multiple responses

Rice Production Practices among the Farmers

Table 2 shows percentage distribution of respondents according to rice production system. The table reveals that majority (92%) of the respondents cultivated rice in lowland/swampy areas, implies that lowland/swampy rice is widely grown by the farmers, thereby dominating other types. This finding is in line with USAID-MARKETS (2010) which reported that rain-fed lowland rice is the predominant rice production system in Nigeria. Majority (86%) of the respondents grew FARO 44 rice variety, implies that FARO 44 is widely grown by the farmers and this could be attributed to its high yield and other numerous good qualities. Majority (85%) of the respondents used machinery (tractor) in land preparation operations such as ploughing and harrowing, implies that farmers adopted the best method of land preparation. Majority (75%) of the respondents engaged in rice broadcasting method. This may be attributed to labour cost reduction and ease of increase in cultivated area of land, notwithstanding the wastage of seed rice. The nature of rice planting method adopted however affects the yield and the number of hectares a farmer may put under cultivation. Majority (96%) of the respondents applied inorganic manure (Fertilizer- NPK & Urea), implies availability of the inputs in the area. Majority (65%) of the respondents used pre-emergency and post-emergency herbicides for weed control. This implies that chemical weeding is more preferable than manual in the area as the best method of weed control. Also, majority (98%) of the respondents used insecticides and pesticides as the best method of insect/disease and pest control. Majority (97%) combined manual

ISSN 2278–5469 EISSN 2278–5450 I OPEN ACCESS

and mechanical (use of sickle for panicle cutting and then heap gathering using hand; thresher for threshing) means of harvesting. This implies that improved means of harvesting such as combined harvester is non-existence.

Table 2: Percentage distribution of respondents according to rice production system

Rice production system variable	Percentage (n=100)
Types of rice ecologies*	
Upland	55
Lowland/swampy	92
Irrigated	06
Types of rice variety grown*	
FARO 44	86
FARO 52	44
IR14/16	23
Local varieties (IR8, MAS, OB677, BG90, etc.)	15
Land preparation*	
Use of manual	46
Use of machinery	85
Zero tillage-use of systemic herbicide such as *Glyphosate*	26
Rice planting method	
Transplanting	20
Broadcasting	75
Direct sowing (dibbling seeds)	05
Manuring	
Inorganic manure (Fertilizer- NPK & Urea)	96
Organic manure	04
Weed control	
Manual weeding	02
Use of herbicide	65
Combination of manual & herbicides	33
Insect/disease and pest control	
Use of insecticides and pesticides	98
Use of Integrated Pest Management (IPM) strategy	02
Harvesting	
Complete manual (both rice cutting and threshing)	02
Complete mechanical	01
Combination of manual & mechanical (sickle for cutting & thresher)	97
Processing paddy before sale	
Yes	70
No	30
Paddy processing: parboiling	
Use of unimproved parboiling drum	98
Use of improved stainless parboiling rice drum	02
Paddy processing: milling	
Use of old milling machine such as black stone model	99
Use of complete set of rice milling machines & equipment	01
Place where produce is marketed	
In the farm (at the point of paddy harvest)	30
Urban market	05
At the rice mill	65

* =multiple responses

ISSN 2278–5469 EISSN 2278–5450 I OPEN ACCESS

Table 2 also reveals that majority (70%) of the respondents processed their paddy before sale, and this may be attributed to making more gains. Majority (98%) of the respondents used unimproved parboiling drum for rice parboiling due to unavailability of improved ones. Majority (99%) used old milling machine such as black stone model which capacity is low due to unavailability of modern ones and complete sets of rice processing factories in the area. Majority (65%) of the respondents sold their produce at the rice mill, indicates that processed/milled rice is mainly sold at the mill, while paddy is mainly sold in the farm (at the point of paddy harvest).

The findings are in line with that of Nwalieji et al. (2014) who noted that rice farmers adopted most of the recommended improved technologies/ production practices introduced to them. For instance, adoption of: FARO 44 (Sipi 692033) as the major improved rice variety among other varieties, good land preparation using either manual or machinery (tractor) orzero tillage (use of systemic herbicide such as *Glyphosate*),direct seed broadcasting on wet field and upland rice in rice planting, fertilizers such as NPK and Urea being applied intensively and at recommended quantity, manual and chemical (herbicides) weeding, insecticides and pesticides for insects, pests and diseases control, sickles and threshers for harvesting, processing of paddy at various processing factories or sold their paddy produce in their farms or farm gate with 100kg sac bag at price reached with buyers.

Profitability of Rice Production Enterprise

Table 3 shows Gross margin (GM) analysis of one hectare of farmers for 2019 rice planting season, comparing the farmers' decision to sale their paddy immediately after harvest; and/or decision to sale after processing. The average quantity of paddy rice produced per a hectare was 24 bags of 100kg bags (2,400kg or 2.4tonnes/ha), while the average quantity of milled rice produced per a hectare was 84 bushels of 25kg bags (42 bags of 50kg bags =2,100kg or 2.1tonnes/ha). This implies that rice yield in the area is encouraging but needs to be beefed up in order to yield higher. Data in the table also reveal that total rice production costs per 1 ha were N246,700 and N355,900for paddy production; and paddy production and processing, respectively. This implies that rice farmers incur high cost of production and processing in the area. The average total revenue from paddy and milled rice sales per a hectare were N440,000 and N588,000, respectively. The finding implies that rice farmers realize high income in rice production especially in processed/milled form. This gave gross margin/net profit of N193,300 and N232,100 from paddy and milled rice sales per a hectare, respectively. This implies that rice farmers made greater profit in selling their rice produce in processed/milled form. Therefore, the two forms of rice sales compared are lucrative and profitable, but rice sold in milled form is better since it profited the farmers more.

Table 3: Gross margin analysis of 1 hectare of farmers for 2019 rice planting season

Operation	Unit	Qty	Unit price ₦	Total Value ₦
Paddy production cost:				
Planting materials (seed rice)	100kg bag	2	15,000	30,000
Rent on land	Plot	2	20,000	40,000
Purchase of herbicides (Round-up)	Litre	4	1,100	4,400
Purchase of pre-emergency herbicide	Litre	2	4,000	8,000
Purchase of herbicides (Propanil & 2-4-D)	Litre	5	3,500	17,500
Purchase of fertilizers	50kg bag	6	8,000	48,000
Purchase of Insecticides	litre	2	2,500	5,000
Land preparation- Mechanical/ manual	Plot	2	12,000	24,000
Seed rice broadcasting	Plot	2	1,000	2,000
Herbicide application	Plot	6	1,000	6,000
Insecticide application	plot	2	1,000	2,000
Fertilizer application	plot	2	1,000	2,000
Manual weeding (optional by picking)	Plot	2	2,500	5,000
Harvesting (cutting & gathering of rice panicles)	chain	16	1,800	28,800
Harvesting (mechanical threshing)	Heap/plot	2	12,000	24,000
(A)Total production cost per 1ha				**246,700**
Processing cost:				
Handling &transportation of produce	Bag/kg	24	1,000	24,000

ISSN 2278–5469 EISSN 2278–5450 I OPEN ACCESS

Processing (rice parboiling)	drum	6	10,000	60,000
Milling	25kg bushel	84	300	25,200
(B)Total processing cost per 1ha				**109,200**
(C)Total production and processing (A+B)				**355,900**
Revenue from 1 hectare of rice:				
(R1)Total revenue from paddy rice	Bag (300kg)	22	20,000	**440,000**
(R2)Total revenue from milled rice	25kg Bushel	84	7,000	**588,000**
Gross margin/Net profit for paddy (R1-A)				**193,300**
Gross margin/Net profit for milled rice (R2-C)				**232,100**

Extent of Farmers' Involvement in Rice Intervention Programmes and Projects

Table 4 shows mean distribution of farmers according to their extent of involvement in rice intervention programmes and projects. The table reveals that farmers were highly involved (M ≥ 2.50) in Fadama projects (M=3.55), ADP (M=2.76), USAID MARKETS Project (M=3.00), Lower Anambra Irrigation Project (LAIP)(M=3.88), IFAD Value Chain Development Project (M=3.74), GES Scheme (M=3.66), Anambra State Government programmes(M=2.55) and Rice Box (R- Box) (M=2.50). However, National Programme on Food Security (NPFS) (M=2.05), The Livelihood Improvement Family Enterprise (LIFE) (M=1.86) and NGOs (M=1.44) recorded low involvement of farmers. The findings imply that the rice farmers have been involved in various rice intervention programmes and projects initiated in the area, hence the high rice production.

Nwalieji (1999) recalled that the implementation of the Lower Anambra Irrigation Project (LAIP), Omor covering 5,000 hectares took off in 1981 and the objectives were to: increase rice yield; have double cropping in a year through irrigation; teach farmers modern rice production techniques; improve the standard of living of the communities within the project location; and train the staff and farmers both locally and overseas. However, the project made some appreciable impact on the socio-economic life of the people within and outside Ayamelum LGA. Nwalieji, Madukwe, Agwu and Matthews-Njoku (2016) noted that USAID-MARKETS project made some impacts in rice productivity of the farmers. It had a mandate to work along the entire rice value chain in order to improve on- farm productivity and sales and income. It provided technical assistance, training, and access to production technology through small farmer/producer associations (USAID-MARKETS, 2010). The GES is aimed at delivering subsidized farm inputs to farmers and facilitating a shift from subsistence to commercial farming. Under the scheme, registered farmers receive e-wallet vouchers with which they can redeem fertilizer and seeds from agro-input dealers, and Nwalieji et al. (2015) reported that rice farmers had high level of satisfaction on the scheme's implementation. Nwalieji (2006); Nwoye and Nwalieji (2019) noted that the National Fadama Development Projects I, II, III and Fadama III- Additional Financing (AF) project were implemented from 1993 to date within various periods. According to Nwoye and Nwalieji (2019), the current project, Fadama III Additional Financing (AF) Project in Anambra State covers both rice and cassava value chains. The objective of the AF according to them, is to increase the incomes for users of rural lands and water resources within the Fadama areas in sustainable manner throughout the recipient's territory, and it is said to have made some achievements.

Table 4: Mean distribution of farmers according to their extent of involvement in rice intervention programmes and projects

Intervention project/ programme	Mean (M)	Standard Deviation (SD)
Fadama projects	3.55*	0.679
ADP	2.76*	0.806
USAID MARKETS Project	3.00*	0.502
Lower Anambra Irrigation Project (LAIP)	3.88*	0.822
National Programme on Food Security (NPFS)	2.05	0.437
IFAD VCDP	3.74*	0.811
GES Scheme	3.66*	0.700
Anambra State Government programmes	2.55*	0.650
Rice Box (R- Box)	2.50*	0.632
The Livelihood Improvement Family Enterprise (LIFE)	1.86	0.312
NGOs	1.44	0.308

*= M ≥ 2.5 = highly involved

ISSN 2278–5469 EISSN 2278–5450 I OPEN ACCESS

The International Fund for Agricultural Development (IFAD)-Value Chain Development Programme (VCDP) initiated in 2014 to enhance the productivity and profitability of smallholder producers, processors and marketers in the crops' (especially rice and cassava) value chain. Government targets to achieve this objective by increasing access of the actors in the rice and cassava value chain to improved inputs, modern technologies, machines and equipment, road, irrigation, water, processing and marketing infrastructure, and finance (Anambra State Value Chain Development Programme (ANSVCDP), 2016). Anambra State Government intervention has been trying its best in giving adequate supports to farmers such as prompt payment of both Local Government and State counterpart funds of initiated projects, grants, incentives, low interest rate loan, inputs and adequate participation in most of the intervention programmes and projects to boost rice production (Nwalieji, 2020).

Constraint to Rice Production

Table 5 shows the mean distribution of respondents according to constraints to rice production. The data reveal that inter and intra communal clash over land ownership with mean value (M)=3.22, cattle menace (M=3.30), inadequate and untimely supply/distribution of agro-inputs to farmers (M=3.05), inadequate fund for start-off (M= 3.44), difficulty in obtaining credit (M=3.35), inadequate improved processing and milling machinery (M= 3.74), high cost of privately sold agro-input such as fertilizers (M= 3.82), poor road network/feeder road (M= 3.65), poor extension service visit to farmers (M= 3.00), high cost of rice production (M=3.68), unfavourable weather condition/climate change (M=3.06), price fluctuation of produce (M=3.32) and ineffective government policies on rice importation (M= 2.68) were the serious constraints to rice production (M ≥ 2.50) in the area.

Table 5: Mean distribution of respondents according to constraints to rice production

Constraint	Mean (M)	SD
Inter and intra communal clash over land ownership	3.22*	0.733
Cattle menace	3.30*	0.765
Inadequate and untimely supply/distribution of agro-inputs to farmers	3.05*	0.697
Inadequate fund for start-off	3.44*	0.780
Difficulty in obtaining credit	3.35*	0.766
Inadequate improved processing and milling machinery	3.74*	0.867
High cost of privately sold agro-input such as fertilizers	3.82*	0.878
Poor road network/feeder road	3.65*	0.805
Difficulty in marketing products	2.00	0.400
Difficulty in forming co-operative society	2.25	0.455
Poor extension service visit to farmer	3.00*	0.655
High cost of rice production	3.68*	0.814
Unfavourable weather condition/climate change	3.06*	0.620
Inadequate land for massive rice production	3.28*	0.672
Price fluctuation of produce	3.32*	0.680
Poor access to improved seeds	1.83	0.380
Ineffective government policies on rice importation	2.68*	0.533
High rodent, pest and disease infestation	2.36	0.486
Poor yield/low productivity	2.22	0.466

*= M ≥ 2.50 = serious problem SD= Standard deviation

The finding is in line with Nigeria MARKETS (2012) which noted that farmers need loans to invest in quality inputs; they need access to inputs, and often require training to increase production and meet quality standards. Adesina (2013) also notes that hardworking farmers, who want to make a good life, were constrained by lack of access to land, credit, technologies, extension and market access. Ajetunmobi (2018) noted that smugglers divert subsidized fertilizer through unapproved routes for sale leaving the intended beneficiaries with no fertilizer. This regrettably increases the price of this commodity and cost of production and decreases profit and income fromrice or other enterprise using fertilizer.

The seasonal invasion of rice farm land by the Fulani herdsmen is a very big threat to both human and crop security and survival in Ayamelum. According to Udemezue and Nwalieji (2017), the periodic struggle between farmers and Fulani herdsmen over a limited land has resulted into conflicts. These conflicts have seriously become more problematic and destructive since Fulani

ISSN 2278–5469 EISSN 2278–5450 I OPEN ACCESS

herdsmen do rely heavily on open and cultivated land to feed their cattle. Nwalieji (2016) noted that rice production is capital intensive, right from planting to processing operations. The poor farmers even found it difficult to obtain credit/loan at low interest rate; hence they depend on local money lenders that give not less than 100% interest, which at end they will not break even. However, farmers need loans to invest in quality inputs; they need access to inputs, and often require training to increase production and meet quality standards.

CONCLUSION AND RECOMMENDATIONS

Rice farmers in the study area cultivated rice in lowland/swampy areas, grew FARO 44 rice variety, used machinery (tractor) in land preparation operations, engaged in rice broadcasting method, applied fertilizers, used insecticides and pesticides as the best method of insect/disease and pest control, combined manual and mechanical means of harvesting, processed their paddy before sale, used unimproved parboiling drum, used old milling machine and sold their produce at the rice mill. The two forms (paddy and milled) of rice sales compared are lucrative and profitable, but rice sold in milled form is better since it profited the farmers more. The farmers were highly involved in many of the rice intervention projects /programmes introduced in the area. Major constraints identified include inter and intra communal clash over land ownership, cattle menace, Inadequate and untimely supply of agro-inputs to farmers, inadequate fund for start-off, difficulty in obtaining credit, inadequate improved processing and milling machinery, and high cost of privately sold agro-input such as fertilizer.

The following recommendations are made:

1. The need to maintain peace and tranquility between and among communities and villages, and between farmers and herdsmen are of paramount in the area. This will boost rice production and ensure security of lives and investments.
2. There is the need for government through intervention projects and programmes to provide various rice farmers' groups with improved parboiling tanks and low capacity complete set of rice milling machines at subsidized rate. There should be provision of functional dryers in every quarters of the LGA to enable farmers dry the parboiled rice easily during the rainy season harvest.
3. There should be timely and adequate supply of agro-inputs such as fertilizers, herbicides, etc. at subsidized rate by the service providers of government intervention programmes and projects on rice production.

Funding:

This study has not received any external funding.

Conflict of Interest:

The authors declare that there are no conflicts of interests.

Peer-review:

External peer-review was done through double-blind method.

Data and materials availability:

All data associated with this study are present in the paper.

REFERENCES AND NOTES

1. Adesina A. Unlocking Nigeria's agricultural potential to create wealth. Paper presented at the Foundation Day Lecture held at CCE Auditorium, Federal University of Technology, Akure (FUTA) on 17th May, 2013.
2. Ajetunmobi W. Smugglers make huge profit diverting subsidized fertilizers in Ghana. African Liberty, 2018. www.africanliberty.org.
3. Akpokodje G, Lançon SO, Erenstein O. Nigeria's rice economy: State of the art. Paper presented at the NISER/WARDA Nigerian Rice Economy Stakeholders Workshop, Ibadan, 8-9 November. Bouake: WARDA, 2001.
4. Anambra State of Nigeria 2017 Statistical Year Book (SYB) (2017). Government Printer, Awka, 2017:1-115.
5. Anambra State Value Chain Development Programme (ANSVCDP)(2016).IFAD VCDP infrastructure needs assessment study – study approach.
6. Nigeria MARKETS. Rice. 2012. http://www.nigeriamarkets .org/Rice.mht. 11th November, 2019.
7. Nwalieji HU. The Impact of Lower Anambra Irrigation Project on Improved Rice Production in Ayamelum L.G.A. of Anambra State. *Unpublished B. Agric. Project*, Department of Agricultural Extension, University of Nigeria, Nsukka, 1999.

8. Nwalieji HU. Evaluation of Fadama Project Phase-1 on Improved Vegetable Production in Anambra State. *M.Sc. Thesis*, Department of Agricultural Extension, University of Nigeria, Nsukka, 2006.
9. Nwalieji HU. Comparative profit analysis of rice production enterprise among farmers in Anambra and Ebonyi states, Nigeria. Asian J. Agric. Ext., Econ, and Soc. 2016: 8(3): 1-11.
10. Nwalieji HU. Omor, the Rice Food Basket of South-Eastern Nigeria. Omor Renaissance, April 25, 2020. https://ezeanaukwu.com/blog/index.php/2020/04/25/omor-the-rice-food-basket-of-south-eastern-nigeria/
11. Nwalieji HU, Madukwe MC, Agwu AE, Matthews-Njoku E. Impact of the United States Agency for International Development Rice Project Phase 1 on Rice Farmers in Anambra and Ebonyi States, Nigeria. Asian J. Agric. Ext., Econ, and Soc. 2016: 9(4): 1-11.
12. Nwalieji HU, Madukwe MC, Agwu AE, Umerah MI. Adoption of rice technologies introduced by the United States Agency for international development in Anambra and Ebonyi States, Nigeria. *J. Agric. Ext.*, 2014:18 (1): 158-169.
13. Nwalieji HU, Uzuegbunam CO, Okeke MN. Assessment of Growth Enhancement Support Scheme among Rice Farmers in Anambra State, Nigeria. *J. Agric. Ext.*, 2015:19 (2): 71-81.
14. Nwoye II, Nwalieji HU. Male and Female Participation in the Implementation of Fadama III Additional Financing Project among Cassava Farmers in Anambra State, Nigeria. *J. Agric. Ext.*, 2019:23(4):119-129.
15. Oduntan JB. Improving the quality of rice production in Nigeria through technology transfer. *The Nigerian Voice*, May, 2, 2019.
16. Okeke CG, Oluka SI. A survey of rice production and processing in South East Nigeria. *Nig. J. Tech.*, 2017:36 (1): 227 –234.
17. Oyeleke BO. Management of major pest of rice in Tanzania. Department of Crop Science and Production, Sokoine University of Agriculture, Morogoro, Tanzania,2009: 12-22.
18. Udemezue JC, Nwalieji HU. Effect of Cattle Menace on Farm Land in Anambra State, Nigeria. *Curr. Trends in Biomed. Engr. & Biosc.* 2017:7(5): 001-006.
19. USAID-MARKETS (2010). Improved package of practices for rice production. Nigeria: Abuja, 2010: 1-28.

Peer-review
External peer-review was done through double-blind method.

Peer-Review History
Received: 29 November 2020
Reviewed & Revised: 03/December/2020 *to* 15/January/2021
Accepted: 16 January 2021
Prepared: 18 January 2021
Published: February 2021